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EXPORT OF PRODUCTS OF THE AGRICULTURAL INDUSTRIAL COMPLEX OF UKRAINE IN THE PERIOD MARCH 2022–JANUARY 2024: ANALYSIS OF SEASONAL FLUCTUATIONS

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Abstract

The purpose of this article is to analyze seasonal fluctuations in the export of agricultural crops from Ukraine in the period March 2022–January 2024. The research used data from a dashboard created by the Office for Entrepreneurship and Export Development together with the Ministry of Agrarian Policy and Food of Ukraine and the Ministry of Infrastructure of Ukraine. In March-April 2022, the total export of a number of types of agricultural products was very low, but over time began to increase significantly and reached its peak in March 2023. This happened due to the adaptation of Ukrainian producers and exporters of agricultural products to the emergence of new challenges. Among Ukrainian agricultural products, corn and wheat have the greatest export potential (over 1.1 million tons per month on average), sunflower oil, meal, rape, soybeans, barley, and sunflower seeds have less potential (over 150,000 tons per month on average), the smallest potential has soybean oil (more than 20,000 tons per month on average). Most types of agricultural products have two distinct phases of export seasonality: growth and decline. In the analyzed period, a seasonal increase in exports was observed for corn – in November-March; wheat – September-February; meal – August-February; rape – August-December; soybeans – October-February. For other types of products, export growth and decline phases changed more often: the increase in sunflower oil exports occurred in November-February and September; barley – in September-February and July; sunflower seeds – in October-December, February and May-July; soybean oil – in October-January and May-July.

Key words: *export, agricultural crops, Ukraine, seasonal fluctuations, analysis*

INTRODUCTION

Starting from February 2022, the agro-industrial complex of Ukraine faced new challenges: problems with sowing campaigns and grain exports. Since export is a source of foreign exchange earnings for the country and contributes to its economic growth, which is extremely important in the current conditions, it is advisable to study the dynamics of export of agricultural products from Ukraine, in particular, to analyze seasonal fluctuations.

A number of publications by domestic authors are devoted to the study of various seasonal indicators in the activity of Ukrainian enterprises: N. I. Chystiak and K. V. Kovtunenko, (2017) – determined the content and essence of the influence of seasonality and factors of seasonality on the activity of wholesale trade enterprises [2]; A. V. Khmelyuk (2021) – analyzed seasonal fluctuations in the sale of water by a small business entity [5]; V. A. Yefanov (2018) – highlighted the dependence of the intensity of logistics operations on the seasonality of grain production [16]. Other domestic scientists focused their attention on the study of seasonal indicators in the foreign economic activity of Ukraine: O. V. Berezovska (2017) – revealed the peculiarities of the use of seasonal duties in the system of customs regulation of foreign trade of Ukraine [1]; N. V. Khalipova *et al.* (2009) – studied seasonal fluctuations in cargo flow during foreign economic activity [4]; O. K. Tkachova (2017) – investigated the use of separate economic and mathematical methods and models for the analysis and forecasting of seasonal fluctuations in the field of foreign economic activity [9]; O. K. Yelisyeyeva (2020) – clarified the need for seasonal adjustment of data from foreign trade statistics [17]. In addition, O. Totska investigated the foreign trade in products of the agricultural sector of Ukraine (2022a, 2022b,

2022c, 2022d) [10, 11, 12, 13]. Regarding the research of seasonal indicators in the agro-industrial complex of other countries, here we highlight the following publications: E. Stoian *et al.* (2014) – analyzed the seasonality of the international flower trade in Romania [8]; M. Velev (2018) – estimated the impact of the seasonality factor on employment and remuneration in agriculture in Bulgaria [14]; I. M. Vlad *et al.* (2014) – studied the seasonality of the total import and export of live animals and the separate sector of the live livestock trade in Romania [15].

The purpose of this article is to analyze seasonal fluctuations in the export of agricultural products from Ukraine in the period March 2022–January 2024.

MATERIALS AND METHODS

The research used data from the dashboard created by the Office for Entrepreneurship and Export Development together with the Ministry of Agrarian Policy and Food of Ukraine and the Ministry of Infrastructure of Ukraine (2024) [6]. Seasonality indices are calculated according to the formula:

$$i_s = \frac{\bar{y}_i}{\bar{y}} \times 100 \quad \text{.....} \qquad (1)$$

where:

$\bar{y}_i = \frac{\sum_i y_i}{k}$ is the average value of the indicator for each month;

$\bar{y} = \frac{\sum_j \bar{y}_i}{n}$ is the average value of the indicator for the entire period;

k is the number of years;

n is the number of months $(n = 1, 2, \dots, 12)$ [3].

In our case $k = 1, 2$ for all months except February; $k = 1$ for February.

RESULTS AND DISCUSSIONS

The actual export data of nine types of agricultural products of Ukraine from March 2022 to January 2024 are shown in Table 1. Since there are no data on the export of rape for March-June 2022, we will put zeros there. The average values of export indicators calculated on their basis for each month are given in Table 2.

Table 1. Export of agricultural products, tons

Year	Month	Corn	Wheat	Sunflower oil	Meal	Rape	Soybeans	Barley	Sunflower seeds	Soybean oil
2022	March	176,614	33,209	29,061	28,954	0	36,034	6,599	9,535	11,550
	April	600,966	9,199	129,607	39,177	0	57,159	11,776	104,049	16,384
	May	959,352	43,541	202,652	100,954	0	66,642	11,601	341,796	16,084
	June	1,013,841	138,435	267,487	93,219	0	71,274	26,045	540,118	18,015
	July	1,098,555	411,755	306,924	141,500	90,523	141,550	183,093	362,110	15,646
	August	1,850,670	899,627	390,571	286,224	624,460	128,369	206,798	153,924	22,401
	September	2,260,019	1,906,493	566,809	391,039	877,254	240,467	397,376	203,031	25,508
	October	2,316,591	1,979,534	433,181	457,234	777,602	230,364	383,477	290,421	25,867
	November	2,024,006	1,581,392	466,368	344,540	412,188	385,032	296,078	376,644	16,548
	December	3,261,374	1,554,649	467,833	330,653	236,796	387,419	179,003	311,550	20,386
2023	January	2,597,230	1,328,623	346,991	294,865	185,868	344,716	168,651	189,787	26,730
	February	3,162,981	1,496,912	409,149	376,190	59,588	401,929	248,137	154,413	20,683
	March	3,806,887	1,786,966	584,215	405,774	64,727	387,374	200,467	186,487	28,731
	April	2,720,112	1,537,772	514,750	284,344	21,980	172,800	193,653	63,485	22,881
	May	2,035,696	1,090,123	456,637	341,642	16,543	260,672	166,391	40,546	28,556
	June	2,352,834	1,271,566	452,732	446,064	9,971	190,839	81,620	21,893	29,234
	July	1,099,313	841,480	502,410	239,716	250,856	70,145	352,228	4,067	27,881
	August	877,138	1,224,404	412,676	332,665	670,340	29,869	146,566	5,688	11,354
	September	627,608	1,272,959	359,964	376,586	649,820	210,399	120,198	6,488	11,286
	October	1,283,543	1,341,132	374,676	391,470	385,798	431,512	54,408	52,379	22,180
	November	2,330,109	1,130,590	506,218	387,397	349,495	505,832	181,368	38,584	27,551
	December	3,116,164	1,844,404	672,776	487,957	330,703	418,074	250,514	27,079	29,757
2024	January	2,930,642	1,503,671	525,940	421,502	320,871	312,616	290,370	36,310	22,052

– minimum values, – maximum values.

Source: Generated by the author based on dashboard data (2024) [6].

Table 2. Average values of agricultural products export indicators for each month ($\bar{y}_i$), tons

Month	Corn	Wheat	Sunflower oil	Meal	Rape	Soybeans	Barley	Sunflower seeds	Soybean oil
January	2,763,936	1,416,147	436,466	358,184	253,370	328,666	229,511	113,049	24,391
February	3,162,981	1,496,912	409,149	376,190	59,588	401,929	248,137	154,413	20,683
March	1,991,751	910,088	306,638	217,364	32,364	211,704	103,533	98,011	20,141
April	1,660,539	773,486	322,179	161,761	10,990	114,980	102,715	83,767	19,633
May	1,497,524	566,832	329,645	221,298	8,272	163,657	88,996	191,171	22,320
June	1,683,338	705,001	360,110	269,642	4,986	131,057	53,833	281,006	23,625
July	1,098,934	626,618	404,667	190,608	170,690	105,848	267,661	183,089	21,764
August	1,363,904	1,062,016	401,624	309,445	647,400	79,119	176,682	79,806	16,878
September	1,443,814	1,589,726	463,387	383,813	763,537	225,433	258,787	104,760	18,397
October	1,800,067	1,660,333	403,929	424,352	581,700	330,938	218,943	171,400	24,024
November	2,177,058	1,355,991	486,293	365,969	380,842	445,432	238,723	207,614	22,050
December	3,188,769	1,699,527	570,305	409,305	283,750	402,747	214,759	169,315	25,072
Average ($\bar{y}$)	1,986,051	1,155,223	407,866	307,327	266,457	245,126	183,523	153,117	21,581

Source: Calculated by the author based on Table 1.

As we can see, in the analyzed period, corn and wheat were mostly exported from Ukraine (over 1.1 million tons per month on average), while sunflower oil, meal, rape, soybeans, barley, and sunflower seeds were exported to a lesser extent (over 150,000 tons on average per month), soybean oil was the least exported (more than 20,000 tons per month on average). In the first two months of the war (March-April 2022), the total export of analyzed agricultural products was very low, but over time began to increase significantly and reached its peak in March 2023.

The negative factors that influenced the decrease in exports in connection with the hostilities in the region were:

1) a significant decrease in cultivated areas. Thus, in 2022, for the first time since 1991 the sown area for grain and leguminous crops reached a minimum value of 12,171 thousand hectares, although in 2021 their area was 15,995 thousand hectares [7];

2) decrease in the number of agricultural enterprises;

3) emigration and internal displacement of citizens;

4) mobilization of agricultural machinery and transport for other purposes;

5) logistical problems, etc.

Therefore, domestic producers and exporters of agricultural products had to adapt to new circumstances. Indexes of seasonality of agricultural products export indicators are presented in Table 3, and seasonal waves are shown in Figures 1–3.

Table 3. Indices of seasonality of agricultural products export indicators (i_s), %

Month	Corn	Wheat	Sunflower oil	Meal	Rape	Soybeans	Barley	Sunflower seeds	Soybean oil
January	139	123	107	117	95	134	125	74	113
February	159	130	100	122	22	164	135	101	96
March	100	79	75	71	12	86	56	64	93
April	84	67	79	53	4	47	56	55	91
May	75	49	81	72	3	67	48	125	103
June	85	61	88	88	2	53	29	184	109
July	55	54	99	62	64	43	146	120	101
August	69	92	98	101	243	32	96	52	78
September	73	138	114	125	287	92	141	68	85
October	91	144	99	138	218	135	119	112	111
November	110	117	119	119	143	182	130	136	102
December	161	147	140	133	106	164	117	111	116

– less than 100 %, – more than 100 %.

Source: Calculated by the author based on Table 2.

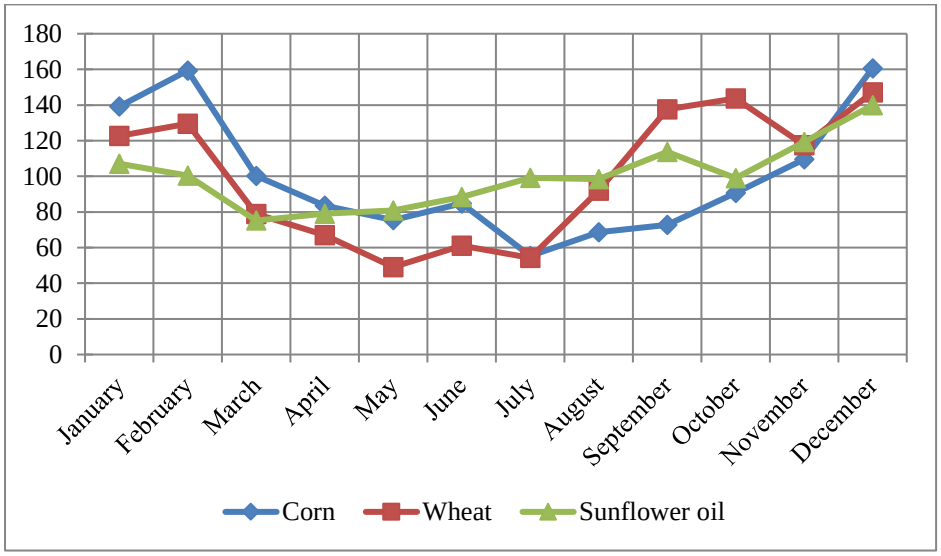

Fig. 1. Seasonal waves of export of corn, wheat, sunflower oil
Source: Author's development based on the data of Table 3.

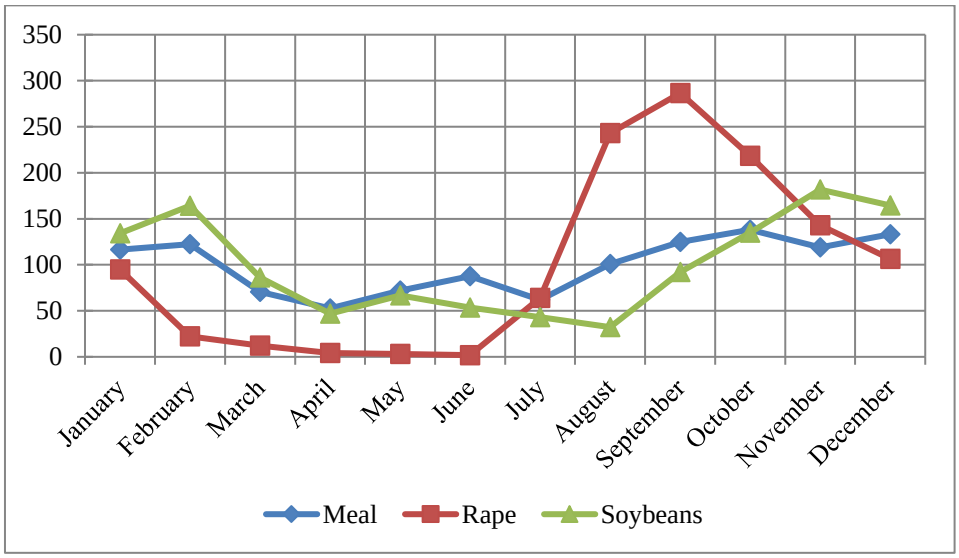

Fig. 2. Seasonal waves of exports of meal, rape, soybeans
Source: Author's development based on the data of Table 3.

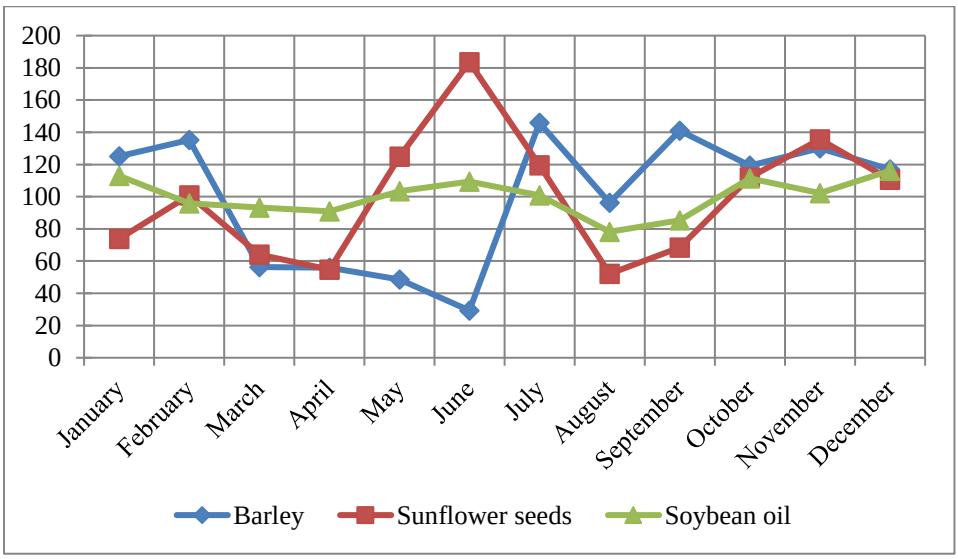

Fig. 3. Seasonal waves of export of barley, sunflower seeds, soybean oil

Source: Author's development based on the data of Table 3.

Note that seasonality indices are used to study seasonal fluctuations. Seasonal fluctuations are more or less stable intra-annual fluctuations in a number of dynamics, which are caused by specific conditions of production and consumption of certain goods or services [2].

Fig. 1 shows that the peak seasonality of corn exports falls on three winter months: December, January and February; wheat – September, October and December; sunflower oil – September, November and December. The seasonal minimum of corn exports is observed from July to September; wheat – from May to July; sunflower oil – from March to May.

As shown in Fig. 2, the maximum values of the seasonality of export of meal occur in September, October and December; rape – August-October; soybeans – February, November, December. And the minimum indices of seasonality of meal export fall on March, April and July; rapeseed – April-June; soybeans – April, July, August.

Fig. 3 shows that the export of barley, sunflower seeds, soybean oil does not have a pronounced seasonality.

CONCLUSIONS

In 2022, the Office for Entrepreneurship and Export Development, together with the Ministry of Agrarian Policy and Food of Ukraine and the Ministry of Infrastructure of Ukraine, created a dashboard for operational interactive information of the public and business regarding the export of agricultural products. Based on the data of this panel, it is possible to analyze the dynamics of export indicators by month and calculate seasonality indicators.

In particular, in the period March-April 2022, the total export of a number of agricultural products (corn, wheat, sunflower oil, meal, rape, soybeans, barley, sunflower seeds, soybean oil) was very low, but over time began to increase significantly and reached its peak in March 2023. This happened thanks to the adaptation of Ukrainian producers and exporters of agricultural products to the emergence of new challenges: a decrease in cultivated areas and the number of agricultural enterprises, emigration and internal displacement of citizens from the affected area, mobilization of agricultural equipment and transport for other purposes, as well as logistical problems.

Among Ukrainian agricultural products, corn and wheat have the greatest export potential (over 1.1 million tons per month on average), sunflower oil, meal, rape, soybeans, barley, and sunflower seeds have less potential (over 150,000 tons per month on average), the smallest potential has soybean oil (more than 20,000 tons per month on average).

The construction and analysis of seasonal waves of exports of agricultural products for the period from March 2022 to January 2024 allow us to draw the following conclusions: most types have two distinct phases of export seasonality: growth and decline. In particular, a seasonal increase in exports was observed for corn – in November-March; wheat - September-February; meal – August-February; rape – August-December; soybeans – October-February. For other types of products, export growth and decline phases change more often: sunflower oil exports increase in November-February and September; barley – in September-February and July; sunflower seeds – in October-December, February, May-July; soybean oil – in October-January, May-July.

We see further directions of scientific research in the study of the dynamics and analysis of the seasonality of the export of agricultural products of Ukraine by type of transport (ferry, car, railway, ports).

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